4CS016 Workbook 1

This workbook is intended to be completed during teaching week 2 & 3 of the module

There are activities that need to be completed and put into the Portfolio available under the assignment TAB on Canvas

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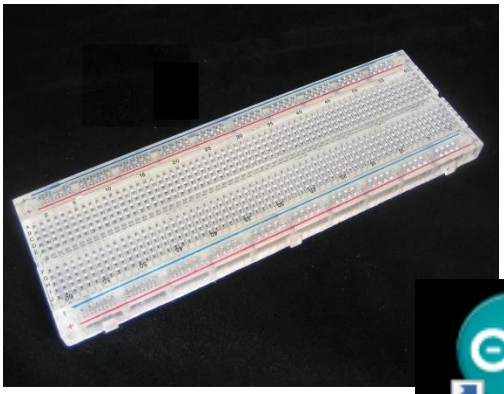
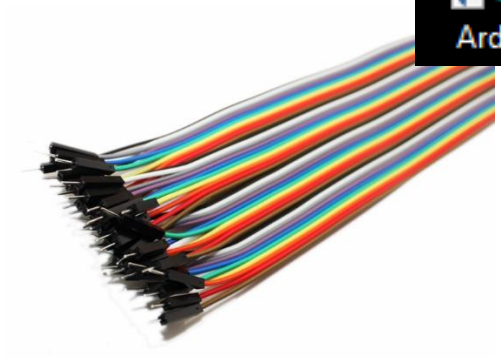
Lab 1: Connecting Power

You will need

- Breadboard
- Arduino Uno
- Red Wire
- Black Wire
- USB Cable
- PC Running Arduino Sketch

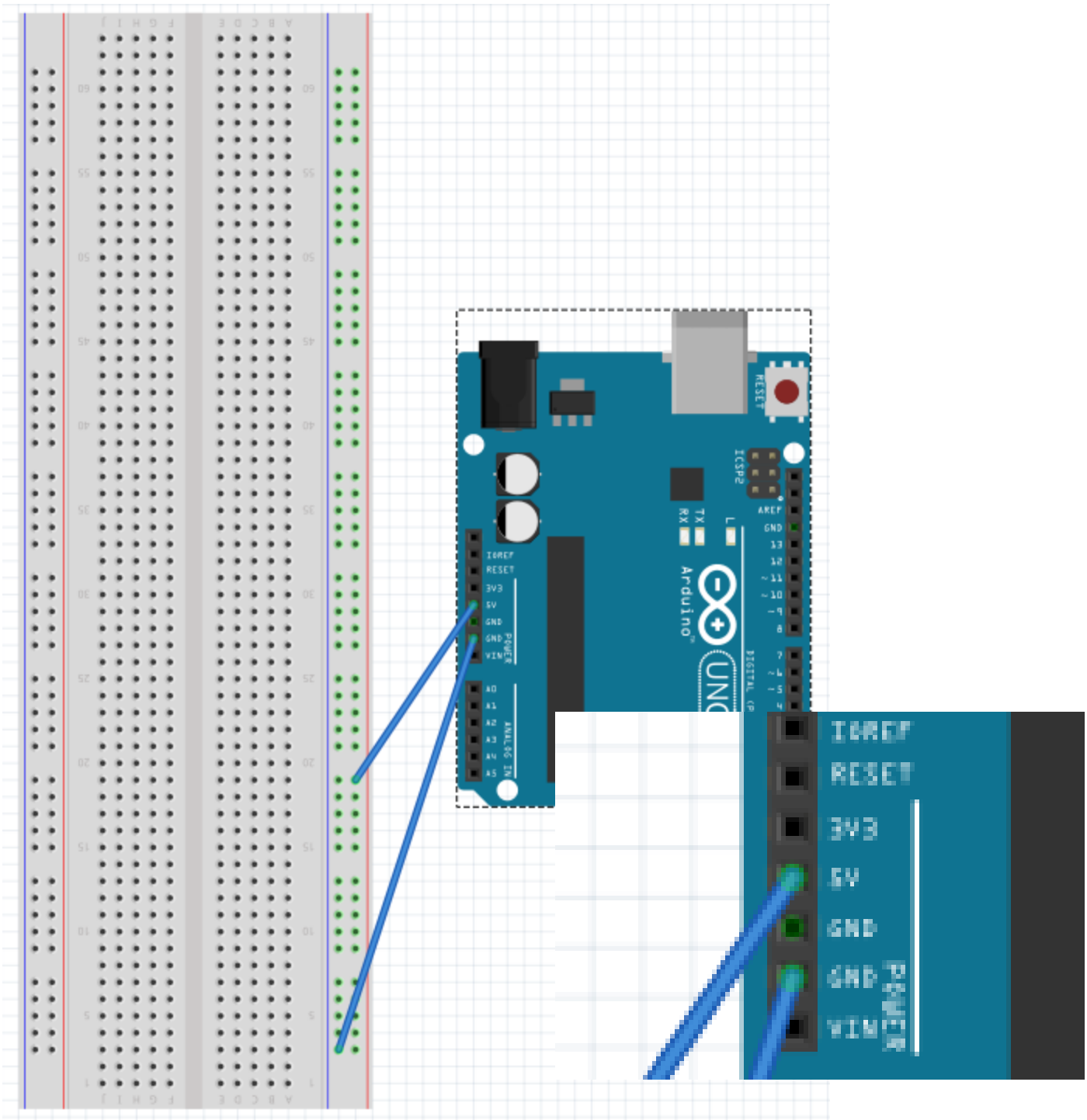




Step 1: Connect the +5V from your Arduino to the red line on your Breadboard

Step 2: Connect the 0V from your Arduino to the Black (or blue) line on your Breadboard.

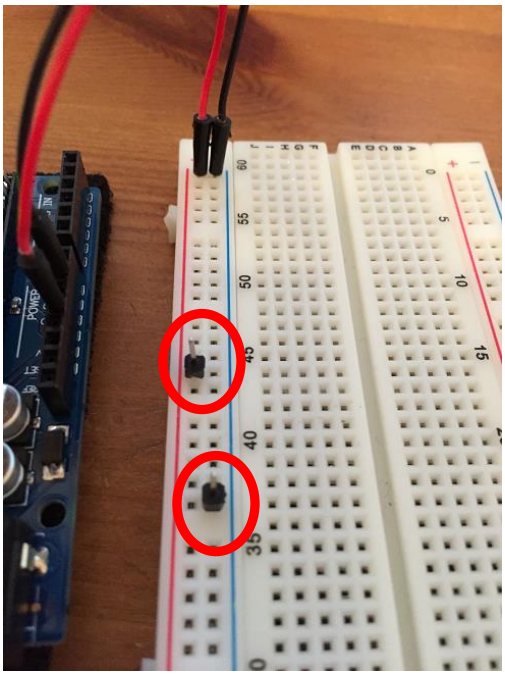
IF you are using TinkerCAD you will need to use the “Breadboard Small”


IOREF
RESET
3V3
5V
GND
GND
VIN

Step 2: Insert 2 of the pins into the breadboard as shown. (Skip in TinkerCAD)

Note,

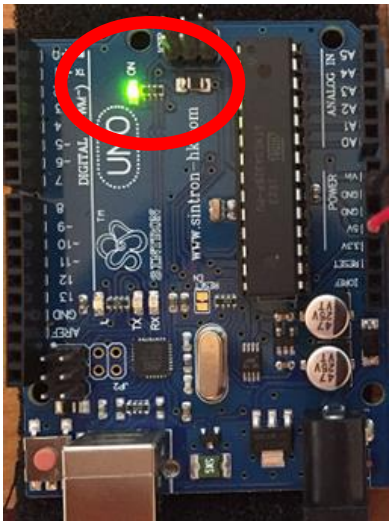
Best not to put these too close together in case you short them together which would cause a short circuit. Break them apart with a pair of pliers, beware they can be sharp.



One should be on the +5V line the other on the 0V

Step 3: Connect the USB Cable from the Arduino to the PC.

Notice the Power on Light is illuminated on the Arduino. (Start the Simulation in TinkerCAD)



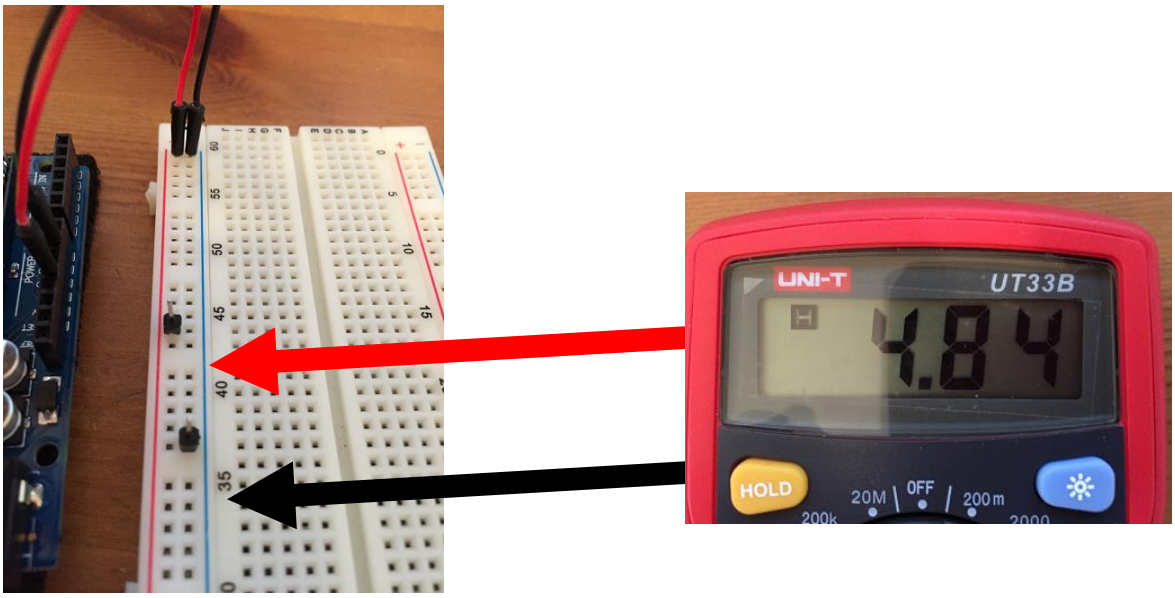
Step 4: Using a Multi-meter (set to Voltage) you will need to check the voltage of the 2 pins on the board.

Set to the correct voltage range (you are checking around 5V so on my meter that is a range of 0-20V)

Connect the red lead to the V

Black cable to COM

Step 5: Now carefully check the voltage reading on the 2 pins we inserted earlier, I got around 4.84V on a Sintron board. (In TinkerCAD you should get 5V)



Complete Activity 1.1 of the Portfolio

Step 6: Disconnect the USB cable

Step 7: Connect the red wire to the 3.3V pin on the Arduino instead of the 5V.

Step 8: Reconnect the USB cable

Step 9: Check the voltage on the 2 pins on the breadboard

Complete Activity 1.2 of the Portfolio

Step 10: Disconnect the USB cable

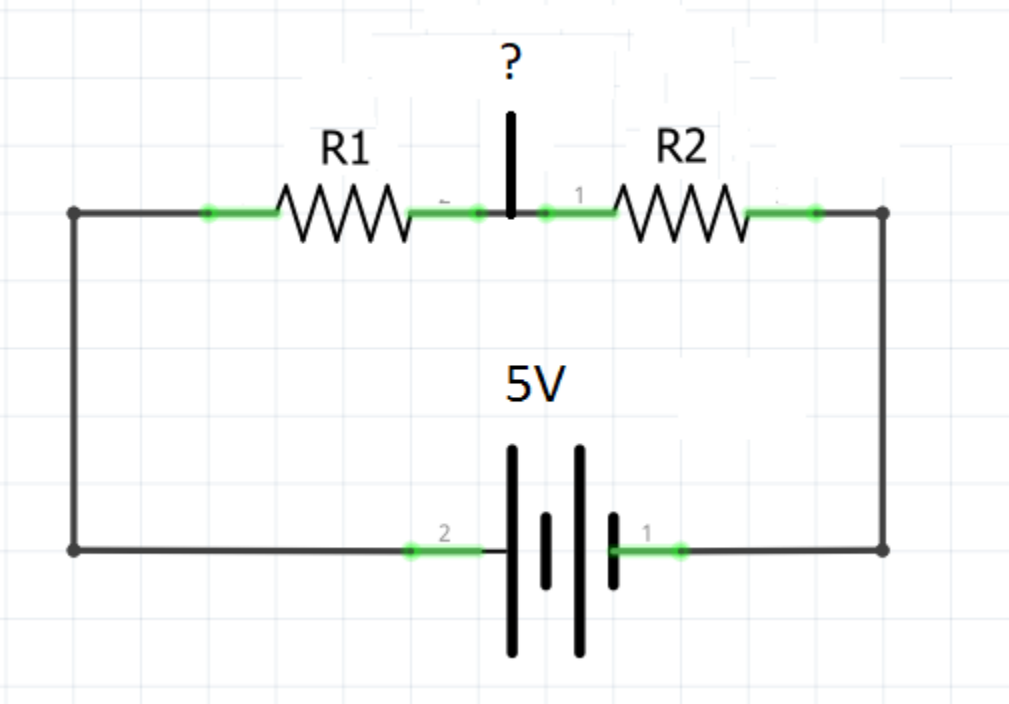
End of Lab 1

Please continue with Lab 2

If using Tinkercad, ignore steps to connect/disconnect the USB

Lab 2: Resistors

Step 1: Referring back to the lecture slides on “Resistors to manage voltages.”



Step 2: Work out what resistors would we need to create a potential divider to supply the following:

2.5V

Complete Activity 1.3 of the Portfolio

Step 3: Taking the Voltage, you read earlier in Activity 1.1 work out the closest you can get to a 3V voltage using the 220 ohm resistors.

Hint

You may need serial and parallel resistors to achieve this, but your choice.

Complete Activity 1.4 of the Portfolio

Step 4: Wire the circuit on your breadboard, what voltage did you get and was it what you were expecting?

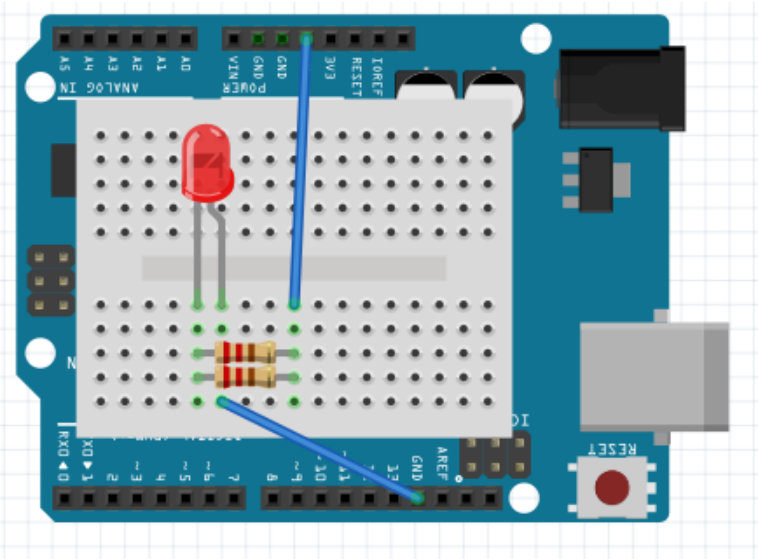
Complete Activity 1.5 of the Portfolio

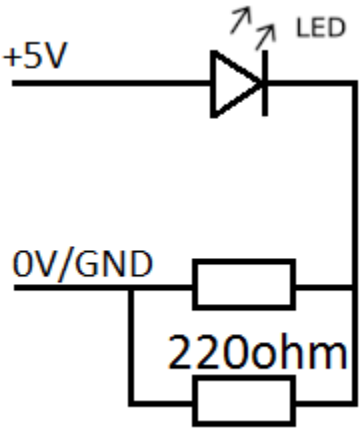
End of Lab 2

Please continue with Lab 3

Lab 3: LED Circuits

Step 1: Referring to the lecture notes, wire up the Led circuit.





Please be careful to wire the LED the correct way around and include the resistors or you could damage it.

Step 2: Now disconnect the USB cable

Step 3: Check each Resistor value with a multi-meter (disconnect one end when checking or you may pick up stray results).

Step 4: Based on the resistors measured, calculate the total resistance of the combined resistors.

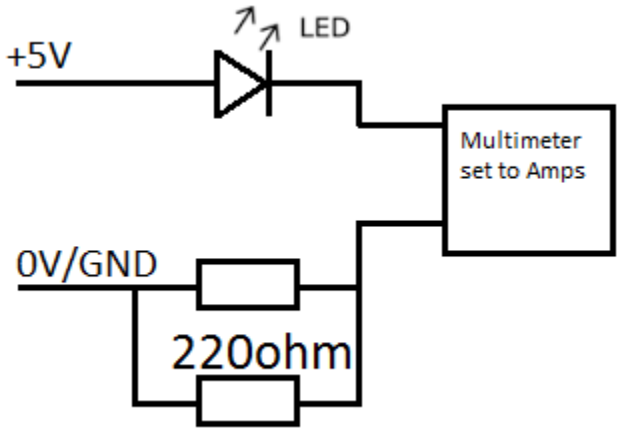
Step 5: Now measure the combined resistance with a multi-meter

Step 6: Is it the same as the calculated value?

Complete Activity 1.6 of the Portfolio

Step 7: Knowing the voltage and resistance, what is the current flowing into the LED?

Step 8: Check the current flowing the through the LED, this needs to be done in series, if you attempt to measure it in parallel with any device it could damage the meter.



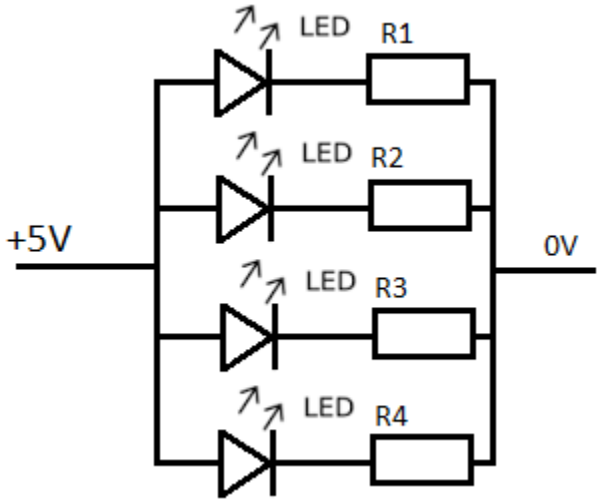
Complete Activity 1.7 of the Portfolio

End of Lab 3

Please continue with Lab 4

Lab 4: Multiple LEDs

Step 1: Wire 4 LED's up and check they all work.



Step 2: Alter the circuit so that the LEDs respond to 4 switches i.e.

- Button pressed LED 1 illuminates.
- Button 2 pressed LED 1 + 2 illuminates
- Button 3 pressed LED 1 + 2 + 3 illuminates
- Button 4 pressed LED 1 + 2 + 3 + 4 illuminates.

Step 3: Draw the circuit in your portfolio using FRITZING.

Complete Activity 1.8 of the Portfolio

End of Lab 4

Please continue with Lab 5

Lab 5: Seven Segment Display

Step 1: Using the 7 segment display and a switch, create the number “5” so that

- If a button is pressed a 5 is displayed

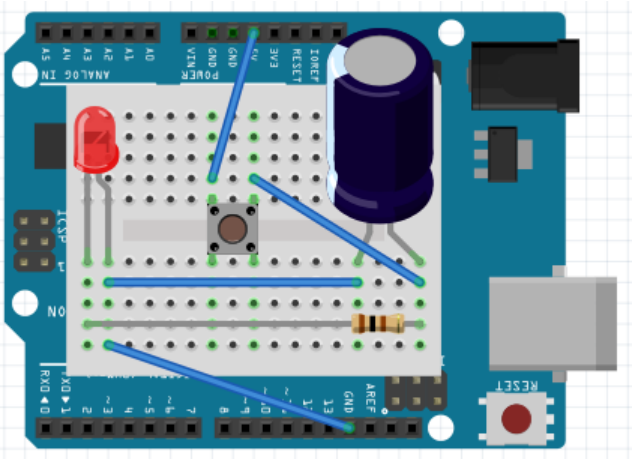
Complete Activity 1.9 of the Portfolio

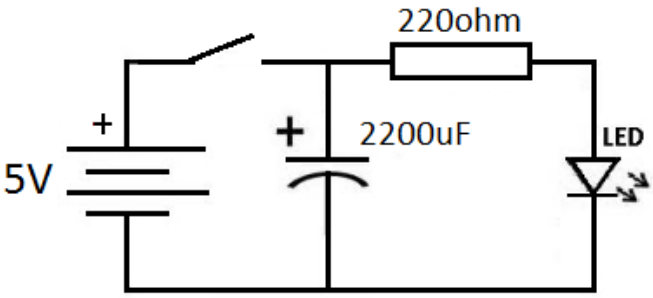
End of Lab 5

Please continue with Lab 6

Lab 6: Capacitors (Skip this on TinkerCAD)

Step 1: Wire up the capacitor circuit shown in the Lecture as “Circuit to Demonstrate Capacitor”





Step 2: Hold the switch down for:

- 10 seconds
- 20 seconds
- 30 seconds
- 40 seconds
- 50 seconds

Using a stop watch release the switch and record the duration of the LED lit for each duration

Step 3: Increase the resistance, hold the button for 30 seconds and record the result

Step 4: Decrease the resistance, hold the button for 30 seconds and record the results

End of Lab 6

Please continue with Lab 7

Lab 7: Forum

For this activity please log into the CANVAS topic and we would like you to make a posting in the forums.

Here we would like you to either make a new posting about your thoughts on what an embedded system is, if a posting has already been made by another student, then please feel free to politely reply to this instead. Your posting should be about a paragraph in length.

End of Lab 7

End of Workbook 1